MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE. Assistant Editor: H. H. KIMBALL.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for September 1902, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: Regular stations of the Weather Bureau, 160; West Indian service stations, 17; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Government Survey, 75; Canadian Meteorological Service, 33; Jamaica Weather Service, 130; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rican Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Capt. François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores; W. M. Shaw, Esq., Secretary, Meteorological Office, London; and Rev. Josef Algué, S. J., Director, Philippine Weather Service; H. H. Cousins, Chemist, and in charge of the Jamaica Weather Office.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard of time is that of San Jose, $0^h\ 36^m\ 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

No storms of tropical origin appeared in the middle latitudes of the North Atlantic. From the 1st to the 4th a disturbance passed eastward over the British Isles, with reported barometric pressure 29.07 inches at Malin Head, Ireland, on the 3d, and 29.08 inches at Sumburgh, Scotland, on the 4th. From the 9th to the 12th a disturbance of moderate strength moved from a position near the Azores northeastward to the south part of the North Sea. During the 15th the barometer fell rapidly over Scotland, and on the morning of the 16th a reading of 29.22 inches was reported at Sumburgh. During the 16th the storm center moved beyond the region of observation in the direction of the Scandinavian Peninsula. On the 17th there was evidence of a storm development near the Azores, where a trough of low barometric pressure was shown between two areas of high barometric pressure, one southwest of the British Isles, and the other over the western Atlantic. At 8 a. m. of the 18th the barometer had fallen to 29.74 inches at Horta, Fayal. From the 20th to the 23d the center of this disturbance moved northeastward off the west coasts of Ireland and Scotland, and by the 24th had passed to the north of Scotland.

In the United States the first general frost of the season extended from the Northwestern States over the Lake region and central valleys, and as far south as Arkansas and northern parts of Mississippi, Alabama, and Georgia from the 12th to the 14th. Timely warnings permitted protective measures in the districts visited by frost.

Storms of considerable strength crossed the Lake region on the 3d–4th, 8–9th, 27th, and 30th. On the 12th high winds prevailed on the lower lakes attending a storm that passed over the Ohio Valley. On the 24th high barometric pressure over the northern Lake region and low pressure over the middle and lower Mississippi Valley was attended on Lake Michigan by a northeast gale. Ample warning was given and vessels generally sought shelter.

On the 26th and 27th heavy rains in southern Texas caused some damage to cotton, and resulted in floods that drowned cattle, washed away bridges, and damaged railway tracks. All available means of communication were utilized to distribute warnings regarding the impending floods.

BOSTON FORECAST DISTRICT.

The weather of the month was without special features, excepting the excessive cloudiness which was almost continuous after the 17th.—*J. W. Smith, Forecast Official.*

NEW ORLEANS FORECAST DISTRICT.

The first frost of the season occurred in the northern por-

tion of the district on the morning of the 13th for which warnings were issued on the morning of the 12th.

The Daily States of September 13, 1902, commenting on the forecasts and warnings, says:

The frost predicted for the northwestern portion of the cotton belt came just as expected. The gratifying feature is that no important weather changes take place without timely warning of their coming being given by the Weather Bureau, and the confidence which the people show in these warnings is not misplaced.

I. M. Cline, Forecast Official.

CHICAGO FORECAST DISTRICT.

A larger number of storms than usual for the season crossed the upper lakes. The storms, while not unusually severe, had greater intensity than is generally experienced in September. Warnings were issued well in advance of the gales, and no casualties of consequence have been reported. The first marked frost condition moved from the extreme northwest over the upper Mississippi Valley and the upper Lake region from the 3d to the 5th. On the 12th and 13th frost occurred practically throughout the entire district, freezing temperatures occurred in the western portion of the district, and the frost was heavy as far east as the Ohio Valley. Frost of less consequence occurred at other times during the first and second decades of the month. Warnings were issued well in advance of the frosts.—*H. J. Cox, Professor.*

DENVER FORECAST DISTRICT.

Timely warnings were issued for the first severe frost of the season which occurred in Wyoming and eastern Colorado on the morning of the 12th; also for the heavy frost of the 27th in Utah and the lower Arkansas Valley. Notices of light frost were included in the forecasts.—*F. H. Brandenburg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The month as a whole was an unusually quiet one. Dense smoke prevailed from about the middle of the month for a period of a week or more. The smoke was due to extensive forest fires in the northern Pacific coast States.—*A. G. McAdie, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

The only special feature of the month was a storm which swept across the district on the 26th, in connection with which shipping interests were given ample warnings. Sharp frosts occurred frequently during the latter portion of the month, and as a rule they were accurately forecast.—*E. A. Beals, Forecast Official.*

RIVERS AND FLOODS.

The rivers, as a rule, conformed to the usual periodical custom, and fell steadily during the month except along the eastern slope of the Appalachians, where heavy rains about the end of the first decade caused a general though not particularly marked rise. Still heavier and more general rains during the last few days of the month caused another rise which was much more pronounced along the Susquehanna River, but not so much so as farther south.

In the upper Mississippi and the Ohio rivers the low stages seriously interfered with navigation. The last through boat for St. Louis left St. Paul on the 24th, while on the Ohio navigation was practically suspended north of Cincinnati, only a few local boats remaining on the river. Navigation on the upper Tennessee was also suspended until the heavy rains of the last week of the month afforded some relief.

The highest and lowest water, mean stage, and monthly range at 143 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.*	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
High areas.										
I	1, a. m..	41	101	4, a. m..	46	60	2,250	4.0	562	23.4
II	2, a. m..	52	122	6, p. m..	46	60	3,600	4.5	800	33.3
III	5, p. m..	47	123	9, a. m..	46	60	3,550	3.5	1,014	42.3
IV	8, a. m..	49	124	12, p. m..	46	60	3,800	4.5	844	35.2
V	10, a. m..	51	120	17, p. m..	46	60	3,800	7.5	507	21.1
VI	16, a. m..	51	114	19, a. m..	47	84	1,800	3.0	600	25.0
VII	20, p. m..	47	123	21, p. m..	47	97	1,250	1.0	1,250	52.1
VIII	22, p. m..	51	104	26, a. m..	45	67	2,000	3.5	571	23.8
IX	28, p. m..	47	123	30, a. m..	34	102	1,400	1.5	933	38.9
Sums							23,450	33.0	7,081	295.1
Mean of 9 paths							2,606		787	32.8
Mean of 33.0 days									711	29.6
Low areas.										
I	1, a. m..	54	114	5, a. m..	46	60	3,000	4.0	750	31.2
II	3, p. m..	51	120	6, p. m..	46	84	1,700	3.0	567	23.6
III	6, p. m..	51	114	10, a. m..	48	68	2,250	3.5	643	26.8
IV	{10, p. m..	35	106{	14, a. m..	47	65	{ 2,975	3.5	850	35.4
	{12, a. m..	36	87}				{ 1,600	2.0	800	33.3
V	15, a. m..	50	110	{17, p. m..	46	87	1,150	2.5	460	19.2
				{18, p. m..	29	89	2,200	3.5	629	26.2
VI	{18, a. m..	51	120{	24, p. m..	38	90	{ 3,300	6.5	508	21.2
	{18, a. m..	39	120}				{ 3,250	6.5	500	20.9
VII	24, p. m..	51	114	29, a. m..	42	71	2,650	4.5	589	24.5
VIII	27, p. m..	41	118	*1, p. m..	41	70	2,900	4.0	725	30.2
Sums							26,975	43.5	7,021	292.5
Mean of 11 paths							2,452		638	26.6
Mean of 43.5 days									620	25.8

*October.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*Geo. E. Hunt, Chief Clerk Forecast Division.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during September are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau:

Alabama.—The month was too wet for maturing cotton, much of the open cotton being damaged by rain; light frosts occurred in northern and north-central counties about middle of the month, doing no damage; rains beneficial to minor crops and for fall seeding.—*Thomas Crawford.*

Arizona.—Conditions were unusually favorable for farming operations and crop development throughout the month. Showery weather that began during the first week, extended well into the third decade. The water in the irrigating canals was ample for all requirements. The soil was moist and mellow for fall plowing and seeding during the latter part of the month and this work was in active operation. On account of the seasonable weather an increased acreage will be sown in alfalfa and small grain.—*Wm. G. Burns.*

Arkansas.—The drought continued practically unbroken, except by light and widely scattered showers during the first decade. Cotton deteriorated in all sections, being seriously damaged by excessive heat, rust, and bollworms; it opened rapidly and prematurely, but picking was delayed by the hot weather and scarcity of labor. Late corn was